UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,643	10/01/2003	Wan Shick Kim	SUN-DA-106T	1719

23557 7590 09/22/2008

SALIWANCHIK LLOYD & SALIWANCHIK
A PROFESSIONAL ASSOCIATION
PO BOX 142950
GAINESVILLE, FL 32614-2950

EXAMINER	
MULLER, BRYAN R	
ART UNIT	PAPER NUMBER
3723	

MAIL DATE	DELIVERY MODE
09/22/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/676,643	KIM, WAN SHICK	
	Examiner	Art Unit	
	BRYAN R. MULLER	3723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,3 and 5-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,3 and 5-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2, 3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al (2002/0061722) in view of Kilham et al. (4,529,306).

3. In reference to claim 2, Kondo discloses an apparatus to control slurry flow in a chemical mechanical polishing apparatus for planarizing an object to be polished by supplying slurry on a grinding pad through a slurry injection conduit, the apparatus comprising a slurry supply unit (L1, 1) to supply slurry to the slurry injection conduit (57) through a slurry supply line (51 and 56), a by-pass (561) diverged from the slurry line, wherein the slurry in the by-pass is returned to the slurry supply line, a photo image sensor (7) to detect a cross-sectional image of the slurry flowing in the by-pass, a slurry measuring unit (arithmetic processing unit; paragraph 48) to analyze the image captured by the photo image sensor to measure the sizes of particles included in the slurry and the particle density of the slurry across the cross-section of the by-pass (as seen in figure 2), a diluent solution supply unit (L2; water supply) to supply diluent solution into the by-pass to reduce a concentration of particles in the slurry and a slurry

flow control unit (10) to control the slurry supply unit based upon the particle sizes and the slurry density measured by the slurry measuring unit. Kondo discloses that the solution as produced is sampled and diluted with pure water and then irradiated with light (paragraph 3, lines 1-4), wherein the slurry supply unit supplies undiluted slurry to a mixing tank (2), where the slurry is diluted with water (paragraph 32). The diluted slurry then passes through a third tank (3) into the main supply line (56), wherein a portion of the diluted slurry passes through the by-pass (561). Thus, the diluent solution supply unit (L2) does provide diluent solution to reduce a concentration of particles in the slurry, into the by-pass via mixing tank (3) and main supply line (56). However, Kondo fails to specifically disclose a slurry injection nozzle, but does disclose that the slurry is supplied to the work piece of a CMP tool, and it is commonly known in the art that a nozzle may be used to supply slurry to a work piece accurately during the CMP process. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to provide a nozzle to supply the slurry to the substrate in order to control the slurry and make application of the slurry more accurate. Kondo further discloses that the sensor (7) is used to detect the number of large abrasive grains contained in the polishing solution and is a light –extinction type sensor, which illuminates light, provided by a light source such as a laser (paragraph 48) through one side of the by pass, and detects the amount of light that is irradiated through to the other side, which is clearly collecting data based on the cross section of the by-pass that the light is passing through. Kondo further discloses that the sensor may also disclose that other particles (foreign matter) that are generated by pumps and valves may also be

controlled by the particle detector (7; paragraph 72). However, Kondo fails to specifically disclose that the sensor is a photo image sensor that may detect sizes of particles included in the detected cross-section *image* and a particle density of two dimensions of the slurry across a cross-section of the by-pass. Kilham discloses an apparatus for detecting and analyzing particulate matter in a liquid flow that is used to control the processing of the liquid in -situ. Kilham discloses that the apparatus comprises a photo image sensor (observation probe 24) that is positioned to observe and provide an image of a lateral cross-section of the liquid stream to provide accurate and detailed determination of the number, size and kind of solid particles in a liquid stream (Col. 2, lines 17-22 and 56-66). Kilham further teaches that the detecting system is preferable over many other previously known particle detection systems, including laser scanning, similar to the laser light-extinction taught by Kondo, because the system will provide accurate and detailed data, will operate effectively and reliably, is easily adapted to a wide variety of manufacturing equipment, uses a good deal of known, reliable technology and is relatively inexpensive, which will enable widespread practical applications (Col. 1, line 27 – Col. 2, line 55). Thus, Kilham discloses that the detection apparatus is desirable over other similar techniques and is capable of detecting size, number and type of particles within a liquid flowing through a conduit, which is the same function provided by the sensor (7) of Kondo. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the sensor (7) of Kondo with the detection apparatus of Kilham, because the sensors are considered to be known equivalents in the art, both being capable of

detecting particle size, type and density in a liquid stream, Kilham teaches that the apparatus is desirable over laser scanning (like the sensor of Kondo) because it is less expensive and is capable of providing valuable color information for particles within the liquid stream (Col. 2, lines 1-10) and to provide a detection system that will provide accurate and detailed data, will operate effectively and reliably, is easily adapted to a wide variety of manufacturing equipment, uses a good deal of known, reliable technology and is relatively inexpensive, which will enable widespread practical applications, as taught by Kilham. Thus, the photo image sensor of Kilham, when applied to the apparatus of Kondo, which observes a lateral cross-section of the liquid stream will clearly detect a cross-sectional image of the slurry flow in the by-pass and detect sizes of particles included in the cross-sectional image and particle density of two-dimensions (any cross-section being a 2-dimensional layer) of the slurry across the cross-section of the by-pass.

4. In reference to claim 3, Kondo discloses that the diluent for the slurry production is pure water (paragraph 3, lines 1-3).

5. In reference to claim 5, the method of using the apparatus disclosed by Kondo would obviously provide a method to control slurry flow in a chemical mechanical polishing apparatus for planarizing an object to be polished by supplying slurry on a grinding pad through a slurry injection nozzle, the method comprising supplying slurry to the slurry injection nozzle through a slurry supply line, introducing slurry into a by-pass diverged from the slurry supply line, supplying a diluent solution into the by-pass to reduce a concentration of particles of the slurry (both slurry and diluent solution being

mixed together in tank 2 and supplied to the by-pass through main line 56), capturing with a photo image sensor (of Kilham) a cross-sectional image of the by-pass in which the slurry flows and detecting the sizes of particles included in the captured cross-sectional image and a particle density of two dimensions (as discussed supra) of the slurry across the cross-section of the by-pass, analyzing the cross-sectional image captured by the photo image sensor to measure the sizes of particles included in the slurry and the particle density of the slurry across the cross-section of the by-pass, returning the slurry in the by-pass to the slurry supply line and controlling supply of the slurry based upon the measured sizes of particles and density of slurry.

6. In reference to claim 6, Kondo discloses that the diluent for the slurry production is pure water (paragraph 3, lines 1-3)

7. In reference to claim 7, it would be obvious that the density of the slurry supplied to the slurry injection nozzle would be higher than a density of the diluent solution because the slurry supplied to the slurry injection nozzle will have abrasive particles in pure water, where as the diluent solution is only pure water and because the abrasive particles are made of solid material, it would further be obvious that the abrasive grains have a higher density than the pure water or water with a pH adjuster and would thus, make the slurry solution of pure water and abrasive grains have a higher density than the diluent solution.

8. In reference to claim 8, it would further be obvious that the amount of particles in the slurry supplied to the slurry injection nozzle will be higher than the amount of

particles in the supplied diluent solution because the supplied diluent solution does not have any particles in it.

Response to Arguments

9. Applicant's arguments filed 7/2/2008 have been fully considered but they are not persuasive. The applicant makes several arguments that the Kondo reference does not provide a diluent solution **directly** to the by-pass. However, the claims do not require that the diluent solution is provided directly t the by-pass. Thus, the diluent supply (2) of Kondo does supply diluent solution to the by-pass and reduces a concentration of particles in the slurry, as claimed by the applicant.

10. Applicant's arguments with respect to the Kilham (5,191,388) reference have been considered but are moot in view of the new ground(s) of rejection. The current Office Action has removed the Kilham (5,191,388) reference and provided new rejections using the Kilham (4,529,306) reference.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Farkas et al (5,710,069) discloses an apparatus for monitoring and controlling slurry using a photo image sensor, Cerni et al (6,275,290) discloses an apparatus for monitoring and controlling slurry that comprises a by-pass with a photo image sensor to detect a cross-sectional image of the slurry in the by-pass, Kilham (5,191,388) discloses a photo image sensor apparatus for analyzing particulate matter

in slurry flow, Choi et al. (2003-036970) discloses a method for measuring density and particle size in a slurry using ultraviolet light, Lawton (6,347,976) discloses a common CMP system the uses sensors to determine operating properties of the system to control the system and uses a nozzle to supply the slurry to the substrate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN R. MULLER whose telephone number is (571)272-4489. The examiner can normally be reached on Monday thru Thursday and second Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph J. Hail III can be reached on (571) 272-4485. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Bryan R Muller/
Examiner, Art Unit 3723
9/17/2008